DOCUMENT RESUME

ED 206 183 FL 012 487

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TITLE The Ontogenesis of Question Words in Children's Language.
PUB DATE Oct 80
NOTE 16p.: Paper presented at the Annual Boston University Conference on Language Development (5th, Boston, MA, October 10-12, 1980).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Child Language; Discourse Analysis; *Language Acquisition; Language Research; *Morphology (Languages); Psycholinguistics; Young Children
IDENTIFIERS *Questions

ABSTRACT

Questions asked in five play sessions by each of eight children aged 1.6 to 3.0 were analyzed for usage of the wh-interrogatives. About 93% of utterances using "what" and "where" were formulaic constructions (e.g., "Where's NP?" and "What's that thing?"). In order to determine whether children were cognitively segmenting these formulas and learning individual wh-words, the following observations were taken into consideration: (1) that repairs were observed in interrogatives with false starts; (2) that paradigmatic substitutions within formulaic interrogatives showed appropriate alternations (e.g., "What's that?" with "What're those?"); and (3) that wh-interrogatives confined to a single formula type in the first session at times were used in a variety of contexts by the same child in subsequent sessions. This third observation seems in part contradicted by a further observation that the child had not yet developed a what-where distinction by the third session. The following explanation is offered: A frame such as "Whusis?" ("What's this?") will be learned by a child as a unit whose wh-word is not perceived as conveying independent meaning; thus the wh-phoneme will represent a collocation of various wh-words, depending on the child's individual experience. The child becomes aware of the independence of the wh-interrogative and makes appropriate use of it in different speech acts, but the power of the original frame to govern a confusion between wh-words does not immediately diminish. (JB)

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THE ONTOGENESIS OF QUESTION WORDS IN CHILDREN'S LANGUAGE

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The Fifth Annual Boston University Conference on Language Development

October 10-12, 1980

FL 012 487

The Ontogenesis of Question Words in Children's Language

Some of the most congruent reports of language acquisition concern the acquisition of question words. The consistency holds, with only minor deviations, across longitudinal and cross-sectional studies, comprehension and production modes, normal and deviant language populations, a number of different languages, and first and second language learning. The developmental sequence that emerges is (roughly) what and where, who, why, how and when (see Table 1). In production studies the sequence is determined by first occurrence or frequency of each word and explained in terms of lexical semantics and cognitive development. While these factors are surely involved, I suggest that at least some of the universality of these results can be attributed to the fact that question-word studies tally the questions children are interpreted to mean relevant to a situation, rather than what they actually say. There are scattered clues in the literature that this is so. Examples are interpreted wh-questions that actually contain no question word at all (e.g. dat? interpreted as What's that?) and--where discourse data are available--questions that sound correct in isolation but are not appropriate in the given context (for example Where's your birthday? meaning when). It becomes important to ask what children know about the question words in these interrogatives and how they arrive at that knowledge.

This study focuses on the development of wh-words in English, as they are actually pronounced and used by children, as well as their linguistic and extralinguistic contexts. I propose that children first learn wh-interrogatives as set phrases tied to very specific interaction routines such as those described by Jerome Bruner and colleagues (Bruner 1975, Ninio & Bruner 1978) and Catherine Snow (1977, 1978). Once learned, these phrases provide the material for analysis into smaller units.* Learning wh-words involves freeing them from both their linguistic and interaction contexts. It means identifying the correct phonetic chunk, assigning it a meaning and determining how it behaves in syntactic constructions. This happens gradually, and early questions will demonstrate partial knowledge in the guise of inaccurate pronunciation, incomplete and erroneous segmentation, and semantically and syntactically inappropriate use.

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*This is consistent with claims by Bellugi (1967) and Brown (1968), as well as more general claims by Peters (1980).

Method

The data for this study are all the questions asked in five play sessions by each of eight children, a girl and a boy at each six-month age interval from 1;6 to 3;0. The subjects were all normal first-born middle class children from homes where only English is spoken. Play sessions were audio- and videorecorded under optimal conditions in a livingroom setting in a television studio. Interaction was almost exclusively between mother and child, although I was present to handhold a cardioid microphone in a parabolic reflector to obtain an independent high fidelity sound recording and participated in the session when it seemed most natural to do so. Analysis is based on 2,407 child questions, all transcribed in IPA--narrowly where necessary--and interpreted with the support of the video recordings.

For comparability with results of other studies, and to allow description of the data in terms of linguistic maturity, each play session for each subject was assigned to one of Brown's (1973) five developmental stages on the basis of MLU and upper bound. Stages I through V are all represented in this study, albeit unequally, with between four and ten session per stage.

Two coders independently identified wh-interrogatives and categorized them according to wh-word with greater than 90% agreement. The categorization process was intended to be comparable to that of previous reports of question-word development. Utterances were coded as ambiguous in cases where they might not have been wh-interrogatives at all and in cases where neither phonetic nor contextual information clarified which of several wh-words was intended.

Results and Discussion

The children asked a total of 948 wh-interrogatives. Categorization results are presented by developmental stage in table 2. Consistent with many other studies, what and where were clearly the earliest and most frequent, together accounting for 90% of all wh-interrogatives recorded. Which and when were the latest, with who and why, and how falling somewhere between. Like the results of earlier studies, these do not make reference to the presence or quality of the wh-words, or whether the wh-words were the right ones to elicit just that information--if any--the children wished to obtain.

The quality of the wh-words themselves is summarized in tables 3 and 4. About one third of the children's codable wh-words were phonetically accurate. This means that the pronunciation preserved the correct syllable structure, essentially correct consonants, and vowel quality in the right neighborhood. Table 3 shows that the proportion of accurate and complete wh-words increased with the children's linguistic growth, with a corresponding decrease in the proportion of partially incomplete renditions such as [wʌsæt], [hʌtsæt] and [wɛsɪsgo]. About one fifth of the children's wh-interrogatives lacked wh-words altogether until stage V. Table 4 illustrates that virtually all the missing wh-words belonged in what and where interrogatives. The developmentally latest wh-words were pronounced correctly most of the time. It is not immediately apparent whether this was due to the more developed phonological systems and better phonetic control of the older children who used these words, the simpler syllable structure of the words themselves (except which), or the predominance of formulaic frames in what and where interrogatives.

Because of limited time and the distribution of the data, I will restrict the remainder of this report to what and where questions. About 93% of these were constructions that can best be described as paradigmatic frames (Shatz 1979). Where occurred in the frames Where's NP? and Where's NP go? What occurred in What's that?, What's this?, What's that one?, What's that thing? What's that over there? What's that thing over there?, What Pro do? and What Pro make?, with a few other expanded or refined variants. About 1% of the what and where interrogatives were multiword utterances that did not fit these descriptions, and 6% were single word questions.

Children's use of contingent single-word questions constitutes the strongest evidence of acquisition of particular wh-words. This use, which involves correctly segmenting the word within a construction, assigning it a meaning, and identifying it as a sentence constituent, was not recorded before stage III. As an example, I offer a short exchange between 3-year-old Anthony and his mother.

1. M: We saw a big long train
with three engines.

A: Where?

M: Yesterday.

A: Where?
Downtown?

This example is particularly convincing because Anthony responded to his mother's temporal answer with a repetition of his original question and a suggested answer that makes clear his pursuit of locative information.

Given that over 90% of the children's wh-interrogatives were formulaic, and that some of the children did not go beyond these frames at all, how can we determine whether they had learned individual wh-words?

Evidence of identification within formulaic interrogatives derives from self-repairs (Sacks, Schegloff, & Jefferson 1974, Clark & Andersen 1979) and paradigmatic substitution. Repairs were observed in interrogatives with false starts, with the second start more phonetically accurate than the first. This is illustrated by examples 2 and 3.

2. Darcy (2;6:18)
   [wɪzə/wɛrzənʌðɚbinbæg] (Where's another beanbag?)
3. Darcy (2;7:1)
   [wʌs/wʌtsɔvəðɛɚ] (What's over there?)

Repairs also occurred in sequences of interrogatives, when there was no answer forthcoming. This is demonstrated in where sequences in example 3.

4. Graham (2;4:20)
   [aɪz] another [fi]?
   (no answer)
   [waɪz] another tree?
   (no answer)
   [wɛrz] another tree?
   M: There's one.

Paradigmatic substitutions within formulaic interrogatives included alternations likes What's that? with What're those? and What you make, Mommy? with What we make, Mommy?. Another type of alternation counted in with these is What's that? with What is that? with What is it? These substitutions and alternations are not sufficient evidence of segmentation in themselves (consider Brown's 1973 discussion of Adam's it's/it alternation), but can be considered in conjunction with other indicators.

Once a child has identified the substance and constituent status of a particular wh-word, we can ask whether it is analytically used across the board, that is in all contexts where it, by adult standards, occur. The possibility that it does not is supported by a number of ambiguous wh-interrogatives produced by Jane, a 2 1/2-year-old. In her first session her where interrogatives were all variants of [wɛɪsgo]. In the second session she asked several questions of the type [wɛrz] + NP. She continued to ask Where's this go? and several of these included an accurately pronounced where and substitutions, for example [wɛrdəmgo], glossed [Where them go?], indicating that she had begun to break

down this frame into its constituent parts. In session 4 (2;8:16,stage IV) she asked ten single-word wheres, and 15 of her 19 where interrogatives included an accurately pronounced [wɛr], providing even stronger evidence for knowledge about this word. Only one interrogative in this session possibly represented the frame Where's NP go?, but this was pronounced [wʌsæ twʌŋgo] and used like how; it was coded ambiguous. In the last session (2;8:30) all potential where interrogatives were again Where's NP? and Where's NP go? frames, but only two of these could be unambiguously coded. The difficulty can be illustrated with the sequence of interrogatives in example 5, asked by Jane while she was trying to fit shapes into a Tupperware ball. The interrogatives were interspersed with a few comments by Jane and her mother's comments and answers, which were almost all of the type "Well, you just turn that ball a little bit and you might find it".

5. [wʌsə̀ɪswʌngɔmam]
[wɔdɪwo]
[wɔsdɪswʌŋgɔmam/ɪnhɪr]
[wʌtsdɪswʌŋgɔmam]
[ɪdɪswʌn]
[wʌsɪswʌngɔmam]
[wʌsdɪswʌn/gɔmam]
[wʌdɪswʌn]
[wʌsdɪtswʌn]
[wʌsɪfəŋgo]
[ʌsə̀ɪsfowʌn]
[wʌsdɪswʌn]
[owasdɪ]
[wʌtsɪswə̃gɔmam]
[ʌtsjɛ/wʌtsɔdɹtʃarpsɪŋgɔmam]
[wʌsɪswʌn/gɔ]
[wʌsɪsə̀ɔwanəgɔ]

The task accompanying each of these interrogatives was the discovery of the hole that fit each shape. Interpretation of the forms as "where" fits the action context although the meaning overlaps with "How do I do this?". The wh-forms--especially considering Jane's prior progress with [w r]--are more characteristics of what. Interrogatives in earlier sessions demonstrate that Jane could segment where out of its frames and pronounce it properly. There is no phonetic evidence in the last session that she has made a what-where distinction. How can this backsliding be explained?

The answer lies in the power of the frame. It is likely that we learn collocation-size units, which are still stored and accessible in our memories and frequently used even after further analysis has taken place

(Bolinger 1976). The earliest wh-interrogatives recorded for Jane were [wʌsæt], [wʌsɪs] and [wʌsɪsgɔ]. It may be that the first distinction between the meanings of these phrases was carried by the [gɔ], which was carefully preserved in all the first "where" interrogatives. Jane probably pronounced [wɛr] precisely and in isolation during just that time when she was sorting it out. With that job done, she could go back to pairing the familiar wholistic phrase with an appropriate action context. Further support for this interpretation is that Jane's what interrogatives remained rigidly formulaic throughout the period of study.

If this analysis is accurate, the meaning of these interrogatives resides in the whole situated phrase, not in the wh-word. It would not be possible to say what a child knew about individual wh-words that occurred only in such frames. A further implication is that wh-words do not behave as grammatical constituents in these frames, even if they have been so analyzed. This explanation also allows for individual differences, because what is a collocation for one child is not necessarily one for another; this depends on what frequent word combinations each child hears.

The ubiquity and cohesiveness of wh-frames may account for the inappropriateness of other child wh-interrogatives. [wʌsæt] is an indivisible unit in example 6, as is [wʌsæt wʌn] in example 7.

6. Graham (2;4:20)
   [wʌsæt dæ wʌn] (What's that that one?)
7. Jane (2;6:28)
   [wʌsæt wʌnɪzɑɔfɛnɪʃ] (What's that one is all finish?)

As analysis continued to take place, separating what's from that, other segmentation errors were observed, such as inclusion of final /s/ and /z/ as integral parts of whats and wheres. This has obvious implications for claims about contracted auxiliaries in the acquisition of interrogative syntax (eg. Labov & Labov 1977, Ingram & Tyack 1979).

Semantic wh-errors resulted from the children's use of old wh-formulas to express new meanings. For example, several of the children used the general What's that? or a variant in contexts where what color questions would be predicted, as in example 8.

8. Graham (2;4:20)

M: What color's that one?

G: That's a green one.

M: Don't think so.

G: [wʌsæt]

M: Looks like red to me.

!

G: That's green one.

M: That's a green one, eh?

G: [wʌsæt]

M: Looks yellow.

G: It yellow.

The most frequent overextension was where used to mean how. Where was also used by several of the children to cooperatively establish pretend entities in a play episode, when something like "What shall we use to be the X"? seems to be the best translation. Example 9 comes from Anthony, who was pretending to make and serve coffee. Anthony said:

9. Anthony (3;3:4)

A: I gonna make some coffee

M: Okay

A: [wɛrsʌm] coffee?

M: I don't know.

A: [wɛrɪə] spoon?

C: Why don't you use one of the golf tees for a spoon? Or a peg?

Syntactic errors occurred when the children had found the phonetic substance of the wh-word and removed it from its frame. An example from Graham (2;3:15) was Where to put it on? In this case the where was also semantically wrong, used like how.

Table 5 summarizes what the children in this study demonstrated about their knowledge of what and where. What is portrayed is a spotty, imcomplete acquisition of these words. "Knowing" these words is not an all-or-none affair--as we would expect, based on knowledge about word acquisition in general.

It seems very likely that contextually situated wh-interrogatives learned as unanalyzed phrases precede and provide the material for gradual analysis that leads to phonetic, phonological, semantic and syntactic knowledge about each wh-word. At a still later point of development, children must recognize

that individual wh-words work as a class in English. This takes into account both the differentiation and hierarchic integration of progressive e ilibrium (Menyuk 1980, and Werner & Kaplan 1963). This study adds to the mounting evidence that syntactic and semantic competence result from breaking down large units as well as putting small units together, i.e. simultaneous analysis and synthesis.* It also supports claims (e.g. Bolinger 1976, Fillmore 1976, and Goffman 1974) that many common phrases are pulled out of memory intact; just because we can generate them anew each time they are used doesn't mean we do. A final methodological point is that claims about the development of syntax and semantics cannot be made without considering phonetics, phonology and interactional context.

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*This is parallel to claims about early phonological development made by Ferguson & Farwell (1975) and Macken (1979).

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TABLE 1

DEVELOPMENTAL ORDER OF PRODUCTION AND COMPREHENSION OF QUESTION TYPES, CLASSIFIED ACCORDING TO QUESTION WORD

Production

Smith (English)	Wode (Other Languages)	Ingram (Deviant Language)	Lightbown (French as L2)
(yes/no)	(yes/no)		
what	where (stative)	what	où
where	where (directional)	where	qu'est-ce que
	what		quoi
how	who	why a. why	qui
why		b. how come	
		c. what for	
who	how	how	pourquoi
whose			
which	why	who	quel, lequel
			combien
			comment
when	when	when	quand

Comprehension

Ervin-Tripp	Chapman	Tyack & Ingram	Cairns & Hsu
(yes/no)	(yes/no)		
what	what		
where	what-do	where (V intrans)	
what-do	where (place)		
	where (direction)		
	how many		
why	why	why	who
whose	who	who (subject)	
who	whose	where (V trans)	why
how	how	what (object)	
where-from	how much	who (object)	
	how long (duration)		
	how far		
	how often	when	when
when	when		
		how	how
		what (subject)	

SOURCES: Cairns & Hsu 1978, Chapman 1973, Ervin-Tripp 1970, Ingram 1971, Lightbown 1979, Smith 1933, Tyack & Ingram 1977 and Wode 1976.

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Table 2. PERCENTAGE OF TOTAL WH-INTERROGATIVES IN EACH WH-WORD CATEGORY, ACCORDING TO DEVELOPMENTAL STAGE

	Wh-Word						
Stage	What	Where	Who	Why	How	Which	Ambiguous
I	84.2	14.6	. . .	. . .	.6	. . .	.6
II	91.6	6.3	. . .	.7	. . .	. . .	1.4
III	56.7	34.7	1.5	2.0	2.0	. . .	3.2
IV	47.8	26.1	2.2	2.9	. . .	. . .	21.0
V	23.5	64.3	2.0	7.1	. . .	2.0	1.0

NOTE: Stages refer to Brown's stages I-V (1973).

Table 3. QUALITY OF WH-WORD PRODUCTION, BY DEVELOPMENTAL STAGE, EXPRESSED AS PERCENTAGE OF TOTAL[a] WH-INTERROGATIVES, FOR EACH STAGE

	Quality Categories			
Stage	Phonetically Accurate	Partially Incomplete But Interpretable	Phonetically Ambiguous	Phonetically Absent
I	23.4	41.1	8.2	26.6
II	31.5	46.9	1.4	17.5
III	29.0	39.4	5.4	23.0
IV	37.0	19.3	2.2	21.0
V	68.4	20.4	4.1	6.1

[a]This total includes wh-interrogatives coded ambiguous. Percentages include only wh-words assigned to specific types and thus do not add up to 100%.

Table 4. PRODUCTION QUALITY OF EACH WH-WORD EXPRESSED AS NUMBER (AND PERCENTAGE) OF INTERROGATIVES IN EACH WH-WORD AND QUALITY CATEGORY

Wh-Word	Quality Categories			
	Phonetically Accurate	Partially Incomplete But Interpretable	Phonetically Ambiguous	Phonetically Absent
What	139 (23.9%)	255 (43.8%)	19 (3.3%)	169 (29.0%)
Where	144 (53.1%)	82 (30.3%)	21 (7.8%)	24 (8.9%)
Why	19 (95.0%)	1 (5.0%)	. . . .	. . . .
Who	9	. . . .	1	1
Which	2	. . . .	. . . .	. . . .
How	6	1	2	. . . .

NOTE: Percentages are not given for who, which, or how because of their small number.

Table 5. KNOWLEDGE ABOUT WHAT AND WHERE DEMONSTRATED BY EACH SUBJECT

Subject (Stage Range)	Uses Context Appropriate Formulas	Substitutes Within Formulas Correctly	Self Repairs	Uses Word in Novel Constructions	Uses Single Word Contingently
			What		
Chloe (I)	+	. . .	. . .	. . .	. . .
Graham (I-III)	+	+	. . .	. . .	. . .
Darcy (II-III)	+	+	+	+	. . .
Jane (III-IV)	+	+	. . .	. . .	+
Anthony (III-V)	+	+	. . .	+	+
Lindsay (IV-V)	+	+	+	+	+
			Where		
Chloe (I)	+	. . .	. . .	. . .	. . .
Graham (I-III)	+	. . .	+	+	. . .
Darcy (II-III)	+	. . .	+	+	. . .
Jane (III-IV)	+	+	+	+	+
Anthony (III-V)	+	. . .	+	. . .	+
Lindsay (IV-V)	+	. . .	+	. . .	+

NOTE: The two youngest children do not appear in this table because they asked no unambiguous wh-interrogatives.